REF 7/B

EXPANDED TECHNICAL ASSISTANCE PROGRAM

FAO Report No. 35

Report to the Government

of

INDIA

on

PLANT PROTECTION IN UTTAR PRADESH

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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REPORT TO THE GOVERNMENT

OF

I N D I A

ON

PLANT PROTECTION IN UTTAR PRADESH

by

W.A. Rawlins
Plant Protection Specialist

Rome
October, 1952.

FAO/52/11/7116

THE PROJECT

Supplemental agreement number S/3 between the Food and Agriculture Organization and the Government of India provided for technical assistance to the Government of Uttar Pradesh in the field of plant protection. This contract called for a specialist in plant protection "to instruct the local technical personnel in the principles of pest and disease control by the proper use of insecticides, fungicides, cultural methods and resistant varieties."

The writer accepted the assignment and reported to Headquarters, Rome on October 4th. for briefing before proceeding to Lucknow, Uttar Pradesh, India. At this time a communication had been received from Mr. J.E.C. Hansen, FAO Agricultural Expert, transmitting suggestions from Dr. K.B. Lal, Entomologist to the Government of Uttar Pradesh, concerning my program. The suggestions were as follows:

1. "Determination of simple and easily workable methods for assessment of damage caused to crop, fruit trees, stored grains and stored potatoes by pests and plant diseases.

2. Examination of plant protection reports and programs with a view to suggesting improvements in the system of collecting and presenting information being followed at present. Evaluation of the results of control operation against pests and plant diseases, including the economics of various control measures undertaken or proposed.

3. (a) Training of the plant protection personnel with a view to improving the standards of their technical efficiency by courses of lectures and field practice on pests and plant diseases, pesticides and plant protection machines, principles of plant quarantine, fumigation of nursery and grain and potato stocks and storage go-downs with methyl bromide, ethylene dichloride, carbon tetrachloride and carbon disulphide mixtures, soil fumigation with paradichloro-benzene, etc.

(b) General lectures on plant protection methods and work to the general agricultural, horticultural and cane development staff so as to improve the efficiency of their collaboration with the plant protection staff and also of their own work in carrying out routine measures against pests and plant diseases.

4. Testing the performance of pesticides in the field with reference to their effectiveness against pests and plant diseases, phytocidal action, immediate or accumulative effects on soils and crops grown thereon, formulations of sprays and dusts and their dosage per acre for different pesticides against different pests and plant diseases and on different crops."

Soon after arrival in Uttar Pradesh the writer met with Dr. Lal to plan in greater detail the program of the assignment. After considerable discussion it was mutually agreed that most value from the project might come from evaluating the progress of the plant protection service from a detached point of view and suggesting lines of procedure which might make the

organization more efficient. For first hand information on the work of the Service Dr. Lal requested that the writer visit as many of the plant protection centers or field stations as possible, confer informally with the staff and offer suggestions for improvement of their work. In conferring with the plant protection staff, general consideration could be given to some of the points in the above outline when applicable to the work of the field stations.

THE PROGRAM

In the time at the writer's disposal on a 6 months' assignment visits to all of the 21 field stations did not seem feasible or necessary. Hence itineraries were planned to include the main centers and as many of the sub-centers as convenient. Personnel from nearby sub-centers were called to the center for conferences.

Conferences were planned to discuss technical problems of plant protection, difficulties encountered in field operations and general activity of the Service with a view to improvement. Although field operations are at a minimum during the period of November to March visits to the fields were planned to see problems at first hand.

In general the discussions were lively and informative; trips to the field to view field work were, however, few; this was one disappointing feature of the visits to the Plant Production stations.

THE PLANT PROTECTION SERVICE OF UTTAR PRADESH

The organization function, objectives, personnel and cost of operation are described in a bulletin issued by the Dept. of Agriculture, and listed at the end of this report. Certain features will be pointed out as having a bearing on the recommendations to be made later in the context.

- Personnel -

The Service has two divisions; research and field operations. It has been with the latter branch that the writer has been connected during the assignment. The field service at present has 6 main centers and 15 sub-centers staffed with varying numbers of technical assistants, field supervisors and attendants. A senior assistant is in charge of each center, and a junior assistant has charge of a sub-center. The following table indicates the total field personnel of the service.

	at field stations	at Headquarters, Kanpur
Senior grade assistants	6	4
Junior grade assistants	32	7
Supervisors	41	2
Attendants	89	13
Drivers	5	1
Cleaners	5	1
Mechanics	1	1
Total	179	29

- Offices of field stations -

Offices of field stations are usually located in large towns or cities which are the district headquarters. In some cases the office may be housed in the same building with other agricultural agencies. Usually the assistants-in-charge live at or near the office.

- Equipment -

Equipment is mainly of the simple hand operated types with a few engine powered pieces used for specific problems. A complete inventory of machinery in all stores of the field stations is not available but the quantity and selection is adequate for the conditions predominating in Uttar Pradesh. As an example of the equipment assigned to field stations that of the Gorakhpur center is typical, and is as follows:
15 hand rotary dusters, 20 hand sprayers of various types, a power driven duster, 3 small capacity (15-4 g.p.m.) power sprayers and 8 rat fumigating guns.

Sub-centers have more limited supplies because the operational personnel is less than at the center.

- Objectives -

The objectives of the Plant Protection Service have been set forth in the bulletin volume 5 issued by the Department of Agriculture and Animal Husbandry. This publication explains in detail the organization and activities of the service. Briefly the aim is to demonstrate to the cultivators the need for plant protection and the methods that may be used to protect crops in the field or in storage. In due course the cultivator is expected to use on his own initiative the recommended practices. Unfortunately the progress in this direction has not been appreciable nor encouraging.

- Services -

The Plant Protection Service is available to all cultivators as a public service. In India, a land of very poor communications, it may be safe to say that very few cultivators know of the existence of the Plant Protection Organization. In the opinion of the writer the Plant Protection Service has not by any means reached its full potential. Without a doubt this is due to the lack of knowledge on the part of cultivators that such a service exists, in spite of campaigns to advertize the organization.

Upon request from the cultivator the assistant-in-charge despatches a crew with equipment to the infested field which is treated forthwith according to recommendations. Efforts are supposed to be made, by the assistant-in-charge of the crew, to collect the cultivators of the village area at the site of operations for the purpose of explaining the specific need requiring attention at that instant and measures being undertaken. The

writer has not been on enough trips to the field with the operational crews to know if this is carried out. As far as is known no follow-up is made, after control measures have been applied, to point out to the cultivators the beneficial results obtained from the work.

- Charges for services -

By this method of direct aid as a means of demonstration the cultivators should come to know the benefits derived from pest control and carry on by themselves, thereafter looking to the Plant Protection Service only for advice, and not for direct aid. To facilitate matters the Service at its inception proposed to levy charges for the work done by them after adequate demonstrations. This policy should encourage cultivators to buy equipment and materials for their own use, rather than to depend upon a Government agency to do the work for them. A schedule of charges has been instituted but in no case to date does income cover the actual cost of application. It is still much cheaper for the cultivator to engage the Plant Protection Service to do the work than depend upon self-help, thereby defeating the purpose of the plan. It is the intention for the future to increase rates progressively to cover fully costs of material and labor.

The reason for reluctance to charge the cultivators fully for control measures is that the majority are in a very low income bracket and cannot afford pesticides or machines. If the work is to be done it must be the Government's responsibility through the Plant Protection Service. Such reasoning is, of course, valid, but the service is not well enough staffed to accomplish more than a small fraction of all work that needs to be done. Either the staff must be greatly enlarged or the cultivator must accept the responsibility of pest control, the latter being preferable for future policy.

- Area under jurisdiction of field stations -

The area serviced by a field station is usually more than one district, and sometimes three. Requests for aid may come from long distances and in those instances the movement of staff and equipment is difficult when Government transport is not available. Public carrier is most inconvenient. The efficiency of a station's work must be reduced by fully one-half of potential as a conservative estimate.

- Field reports -

The program of work carried out by the field stations is reported at fortnightly intervals to headquarters where the data are compiled into summary reports for the Government and Central Protectorate. The station reports are rather detailed, for the purpose of keeping a close check on the activities of the station personnel to prevent loafing and cheating. Although these reports may be necessary, the time consumed in compilation is two to four days, and thus the assistant-in-charge is kept at his desk when he could be in the field with his staff. The assistants have time and again complained about the reporting system as an unwelcome burden on their time.

- Refresher courses -

Twice annually the technical staff is called to Kanpur headquarters for refresher courses so that assistants may be instructed in plant protection methods and the use of equipment. A good deal of the instructor's time was spent on subject matter which had apparently been discussed in previous sessions. Recommendations were given orally to the assistants who jotted down notes in their notebooks, a practice which might lead to misinterpretation from illegible writing. Also, the notebooks might be lost, with resultant difficulty.

- Impression of staff and their work -

The technically trained personnel are graduates at the university level with B.Sc. or M.Sc. degrees. Their major subjects have been entomology or plant pathology. As a group the assistants have been well selected and appear to be substantially grounded in the subject matter of plant protection. Their university courses have not been slanted toward the practical aspect of field problems, hence experience is acquired chiefly in their day-to-day contacts with crops, pests and the cultivators. Their overall training seems to be adequate for the type of work needing their attention.

Plant protection equipment used by the field staff is adequate for the type of agriculture in Uttar Pradesh. Cultivators' fields are generally small, and often terraced with practically no border lanes which would permit the use of large machines. Only in the case of mango trees is engine powered equipment justified at present.

Materials recommended at present are few in number. Two to three formulations of benzene hexachloride and DDT are used as well as copper fungicides, seed dressings and rodenticides. The newly developed pesticides commonly used in U.S.A. and Europe have not been released for general usage pending investigation.

The writer therefore concludes that technical assistance is not of great urgency as far as training personnel in field practice or in the use of new pesticides is concerned. A study of the organization with a view to improving the effectiveness of plant protection work seemed more profitable and was undertaken.

SUGGESTIONS FOR IMPROVEMENT OF THE SERVICE

1. A more positive extension program is needed under the existing scheme.

The main objective of the service is furtherance of plant protection practices to save food. A consideration of the situation in Uttar Pradesh indicates without a doubt that the cultivators must accept the responsibility of protecting their own crops if plant protection is to be engaged on a long scale. The purpose of the Plant Protection Service is to demonstrate control measures and otherwise stimulate the tiller of the soil to accept and perform the practices for himself.

In actual performance this intention has not been firmly carried out; rather the Plant Protection Service has tended to become a mere service organization. It has been at the call of the few cultivators who know of its existence and have availed themselves of the opportunity to have plant protection work done for them. These cultivators are no doubt convinced of the value of the control measures performed but still lack the initiative to continue by their own efforts.

As pointed out previously the Plant Protection Service cannot expect to do more than a mere fraction of the actual field work that needs to be done. Extension teaching must be more widely adopted so that plant protection will be used on an ever widening scale.

It has not been possible to examine in detail the organization of extension in Uttar Pradesh, and the writer is not therefore adequately familiar with the day-to-day functioning of the extension service to make more than a few pertinent remarks on the operation of plant protection. The extension activities at the village level are performed by separate and quite independent departments, i.e. Agriculture, Animal Husbandry, Public Health, etc., which have their own staffs and programs. The villager is faced with a multitude of advisors, each dealing with a specific field. Central coordination is supposed to be done by the District Planning Committee. However, the activities of the various departments are so loosely tied together that cooperation between two parallel services such as the Agricultural Office and Plant Protection leaves much to be desired. Administratively, the various extension groups working at the village level answer to their departmental headquarters and not to the District Committee.

It is difficult to say what type of organization may be the most suitable for extension work in Uttar Pradesh. Only experience through trial and error will eventually lead to the solution. If the contention is accepted that the Plant Protection Service should pursue its extension activities more vigorously the following suggestions are offered for consideration.

A complete reorganization of the Plant Protection Service to conform to a new concept is not advisable. The present functioning of the service is known and any new emphasis will be made in the interests of improvement. Hence the regular routine work now performed by the field stations of the Plant Protection Service should be continued, but it is suggested that consideration be given to specific extension projects for each center.

At the outset it would be advisable to restrict such projects to a few of the centers, for instance, Lucknow, Meerut, Gorakhpur and Allahabad. When experience has been obtained and difficulties met the scheme would be enlarged to include gradually the other stations. The writer feels strongly that the project should start in a small way with genuine and vigorous efforts to give the plan a fair run. The number of stations would depend upon the number of field assistants who are interested in the plan and willing to give it a trial.

- THE PLAN -

Within reasonable commuting distances of a center or sub-center one or more operational areas, each comprising several villages, may be chosen using the following criteria:

1. Pest attacks are known to cause concern to the villages.
2. Interest in plant protection has not been aroused to such an extent that cultivators are using control measures.
3. The village groups are attached to a Cooperative Union willing to furnish pest control supplies.

One of the assistants, either senior or junior, of the selected stations is given the responsibility for projecting the extension training into the area. These men must be well chosen for their initiative and desire to develop the work. Undesirables or misfits will insure failure of the projects. The assistants so selected must understand that the work ahead is not without difficulties and discouragements. Their success will not be measured in acres treated or rupees of income brought into the public Treasury by charges levied on cultivators for control measures undertaken by the station staff. The success of their work will, rather, be indicated by the ever-widening circle of cultivators who can perform their own plant protection tasks.

When the assistants accept the responsibility of taking part in this venture, administrative policy should be such as will guide them without petty restrictions to dampen their ardour and enthusiasm. The administrative hand should be fairly liberal so that the initiative in the assistants is allowed to develop.

The extension methods to follow for generating interest among the cultivators in plant protection will follow the usual lines of demonstration and propaganda. The detailed methods used will depend upon the capabilities of the assistant and the reaction of the cultivators. Methodology used in the U.S.A. or U.K. cannot be directly applied to India without considerable modifications, since communications, customs and incentives, etc., differ markedly.

The extension scheme will succeed only if the assistant inspires confidence and respect in the cultivators in his dealings with them. This means that he must put himself in their place and act accordingly, adopting a conciliatory attitude toward their orthodoxy. Lack of confidence would be an insurmountable barrier to progress.

Only the blueprint of the plan can be given, since experience is necessary before the proper working details can be determined. After selection of suitable village groups, the campaign to convince and to show the cultivators the need and value of plant protection should be carefully planned. Certain important pest control problems should be selected for each demonstrational site. For example, rat control, control of white ants, gundhy bug and late blight of potatoes offer possibilities. One outstanding success is worth a dozen partial ones. However, the vagaries of pests are such that success does not always come about. This must be accepted as a difficulty common to extension teaching in plant protection.

The next step in the program is to arrange the demonstration before the villagers. First there must be a place to perform the demonstration, and the best site is a cultivator's field. The progressive farmers will be the most receptive, and, furthermore, it is they who are most respected by their neighbours. If the demonstration turns out well their satisfaction with the results will exert a great influence on the rest of the community, even the skeptics. Hence considerable attention should be given to making the acquaintance of prominent leaders among the cultivators to develop an interest in the program. The panchayat organization may be a valuable aid for recruiting reliable and interested cultivators.

Essentially there should be three stages in the program:

(1) announcement of the demonstration,
(2) the demonstration,
(3) the follow-up to show results.

The last is often neglected, yet is vitally important for the successful conclusion of a demonstration.

The first stage would include informing the villagers near the site of operations of the impending demonstration, acquainting them with such details as the pest problem involved, the techniques to be used and the results expected. This may involve a village meeting, or merely a gathering of the village leaders who would be expected to pass the word around to their neighbours. Experience will show what kind of propaganda is needed to create interest among the cultivators.

Stage (2), the demonstration, should be carried out with care and precisoness, for a careless job may result in failure and an adverse reaction to the program. The measures demonstrated should be those that may be used by the cultivators themselves with the equipment and materials available. In the case of spraying or dusting, the area (demonstration plot) treated will depend upon the pest problem at hand. Ordinarily, the most convincing means of demonstrating the value of pest control is to divide a field into two portions and apply pesticide to one part, leaving the other part untreated for comparison. However, it may be necessary to treat an entire field or area in cases where insects continuously migrate

from the untreated part to the treated part, thus nullifying the effects of the application. Comparison of results in this instance must be made with an adjoining untreated area having a similar infestation.

Lastly, a follow-up to the demonstration is essential to impress upon the cultivators the value of the control measures demonstrated in the particular case. A field meeting at the site of operations would be most effective. The benefits derived from the operations should be pointed out, if possible, in terms of increased yields and profits. A further demonstration of the techniques used in protecting the crop is recommended to show the simplicity of the operation and the work involved. If visual differences are evident between the treated and the untreated portions of the field or area, a signpost with a short, concise explanation of the demonstration will help to focus attention on the value of the control operations, and will advertise plant protection in general. Striking differences will not always be evident in which case an intensive follow-up program is not necessary.

The awakening of interest in plant protection will be of no avail unless the cultivators have access to pest control materials and machines. When the demonstrations are planned utmost consideration should be given to selection of sites. Only those in an area serviced by a cooperative union or by a private dealer willing to stock the material supplies should be considered. Supplies should be available when the demonstrations are held in case some cultivators wish to try the measures on their own crops.

As previously stated the villagers may not have the capital to purchase outright the essential materials and equipment, hence a credit plan will undoubtedly be needed to finance their operations. Shortly before the writer's departure from Uttar Pradesh this problem was under consideration by the Co-operative Department of the Government and the Plant Protection Service. A credit plan for the benefit of cultivators was to be drawn up by the heads of the two departments and presented to the Government for approval. It need only be noted here that this part of the program is under way.

As soon as the Co-operative unions or private dealers offer for sale pesticides and equipment they must assume the responsibility for giving directions on proper usage. It is, therefore, essential that the personnel of these agencies be well acquainted with the principles of plant protection, with the recommended procedure for pest control and with the hazards involved in improper use of highly poisonous chemicals. The education program must be extended to the supplier of pest control materials as well as to the cultivator. It may be assumed that the manufacturers of pesticides will lend a helping hand in this task of educating their dealer representatives and the personnel of Co-operative unions. In addition it is strongly recommended that some technically trained personnel from the Plant Protection Service be deputed to work with the Co-operative Department in a training program.

To recapitulate, it is recommended that the Plant Protection Service increase its emphasis on extension teaching in the field of pest control. This will involve a relatively simple application of extension methods to teach cultivators the value of control measures and techniques applicable to the region.

2. The Plant Protection Service should participate actively in the Rural Development Scheme.

The Rural Development program is developing rapidly in Uttar Pradesh by virtue of assistance from the Point Four Program and Ford Foundation. The main objective of this program is to train extension leaders for the villages and thereby fill a void which now exists. Two training centers are presently (April 1, 1952) in operation and others will be started in due course.

The extension workers trained under the Program will be of the multi-purpose type, each with an elementary training in agriculture, adult education and sanitation. The "village level workers" will be able to use only the simple rudiments in teaching the villagers better ways to work and live. Hence training will not be on a high plane in accordance with the needs and with the capacity of the trainees to absorb the subject matter.

In the centers now established training in plant protection has not been instituted due to the inadequacy of the staff in the subject matter field of entomology and plant pathology. Staff members do not consider themselves well enough prepared to teach even the practical side of plant protection.

Since plant protection is vital to agriculture some consideration should be given to the inclusion of the subject in the curriculum of the training centers. In the case of Uttar Pradesh this deficiency has been pointed out in conferences with Dr. K.B. Lal, who is most sympathetic to the principle of close cooperation between his Service and the Development Program. The administrative details which would implement action are essentially a departmental matter and the writer feels that such details will be finalized shortly.

Attention is directed to the appended copy of a letter addressed to Dr. H.S. Pruthi, Government of India Plant Protection Advisor: it was the result of a suggestion from Dr. K.B. Lal that the Plant Protection Officers of the Union discuss a program of cooperation between the Plant Protection Services and the administration of the Rural Development Program. Dr. Pruthi requested the writer for some suggestions which were dispatched in the aforementioned letter.

The Development Program presents an opportunity for the furtherance of plant protection which should not be neglected. In a personal conversation with Mr. Horace Holmes, Agricultural Advisor to the Government of India, Mr. Holmes was concerned about the need for foreign technical assistance when the expanded Development Program gets underway. He indicated a desire for cooperation between FAO and the Point Four Program in securing such assistance if the need arises.

The writer feels that the need will be for a few technically trained plant protectionists with a background of experience in extension teaching. They would be used as advisors to guide the local Indian staff in their work of instruction and demonstration.

3. The FAO fellowship program would be a valuable aid to the Uttar Pradesh Plant Protection Service.

Correspondence has passed between the Fellowship Officer of FAO and the writer regarding fellowships for staff members of the Plant Protection Service. Conferences and discussions have been held with Uttar Pradesh Government officials, particularly Mr. A.N. Jha, Secretary of Agriculture, and Dr. Lal on the same subject. Consequently, applications will be submitted for three fellowships as follows:

a). A member of the research staff to study:

Pesticide residues on plants in relation to public health.
Pesticide accumulation in the soil from application to crops.
Standardization of pesticides, including labelling.
Plant quarantine organizations for inland States.

b). A member of the field staff to study:

Plant protection methods in Japan.

c). A member of the field staff to study:

Plant protection methods in U.S.A. including extension methods, demonstrations, use of various types of application machinery and pesticides.

4. Consideration should be given to regulation and sale of pesticides.

This subject has been brought to the attention of Dr. H.S. Pruthi in the attached letter. At the moment the use of pesticides probably does not present a serious hazard and the need for regulation is unnecessary. The materials now in everyday use include a narrow line of BHC and DDT formulations

besides a few copper fungicides, zinc phosphide rat poison and a miscellaneous collection of fumigants and seed dressings. As the number and quantities of pesticides increase, serious difficulties may arise in misuse of highly poisonous chemicals, necessitating certain regulations. As suggested in the letter to Dr. Pruthi, a code of labelling should be promulgated to establish purity and standardization in recommended uses. Such action would be the function of the Central Protectorate and not of the individual states.

Certain other suggestions have been made from time to time to Government officials of Uttar Pradesh and further comment need not be made in this report. Reference may be made to the appended copies of letters transmitted 27 March 1952 to Mr. A.N. Jha and 21 January 1952 to Dr. K.B. Lal.

SUMMARY

The Plant Protection Service of Uttar Pradesh was analyzed on the basis of equipment, personnel and training and effectiveness. The equipment is adequate for the type of work being done. The personnel is adequately trained and in sufficient numbers for the initial phases of the work with field stations and sub-stations well scattered over the State. In spite of these favorable factors, the Service has not nearly reached its potential for service to the cultivators. A major reason is the tendency to make the Service one of direct action in plant protection with service charges below cost rather than expanding its teaching phase through demonstrations of the economic value of plant protection. The work of the Service has not been sufficiently widely publicized among the cultivators. Transport is inadequate and the system of reports is unduly burdensome, both resulting in much lost time by the trained personnel.

To improve the Service it is recommended:

(1) That major attention be given to a more positive extension program to educate the cultivators towards doing their own plant protection.

(2) That in order to establish a positive extension program specific extension projects should be well planned and executed for each center.

(3) That single projects be initiated in Lucknow, Meerut, Gorakhpur and Allahabad on pests known to the cultivators to cause frequent damage.

(4) That only truly interested project leaders should be given the responsibility of carrying out the projects in three distinct phases:

(a) Announcement of the demonstration.
(b) The demonstration.
(c) The follow-up to show results.

(5) That the Plant Protection Service should actively participate in the Rural Development Scheme by assisting in the basic training of the "village local workers".

(6) That advantage be taken of the FAO Fellowship program for assistance in specialized fields.

(7) That consideration be given to the regulation and sale of pesticides.

It should be noted that the recommendations are within the present capacities of the personnel and equipment and will not require additional funds.

APPENDICES

A. Letter of April 10, 1952 to Dr. H.S. Pruthi.

B. Letter of March 27, 1952 to Mr. A.N. Jha.

C. Letter of January 21, 1952 to Dr. K.B. Lal.

D. A brief note on the Plant Protection Service in Rajasthan.

E. Plant Protection Organization - Bombay State.

F. Note on the Plant Protection Service in Madras State.

G. Plant Protection in the United States.

APPENDIX A

FAO Information Service
New Delhi
April 10, 1952

Dr. H.S. Pruthi
Plant Protection Advisor
Government of India
NEW DELHI

Dear Dr. Pruthi,

I deeply appreciate your kind invitation to attend the conference of Plant Protection Officers called for April 14th next, but owing to an earlier departure for FAO - Rome Headquarters - I will be unable to be present. Further, I appreciate your confidence in requesting me to submit some remarks pertaining to furtherance of plant protection in India.

Plant Protection in the Indian Union has advanced at an astounding rate during the past five years due to the fine work of the central and State Plant Protection organizations. The administrative and field personnel are to be congratulated on the contributions they have made in reducing food losses from the depredations of insects, plant diseases and rodents. During visits to a few of the Indian States I have had the pleasure of meeting administrative officials who have expressed great satisfaction with the work of the plant protection organizations under their administrations. Still, there is plenty of work to be done.

The conference which you have called will provide a meeting ground for the exchange of ideas and experiences which should prove valuable to all concerned. Foremost in the discussion will be the place of plant protection in the Rural Development Program now underway in many areas of the Union. Opinions may be high or low in regard to the Program but I for one believe that India has a great opportunity in this scheme to develop agriculture along more progressive lines. Most of us will agree that technical knowledge is well advanced but the practical applications have not been put into effect. This is partly due to the orthodoxy of the cultivator, his low economic status, his illiteracy but the cultivator is not entirely at fault. Extension teaching has not kept pace with research.

The Rural Development Program intends to give major emphasis to extension work by developing agricultural advisors for the village and the farm. Plant Protection in its various aspects should be given a high place in the training programs of the extension workers who will be the advisers at the "grass roots" level. I believe that Plant Protection Officers will agree that the burden of pest control should be borne by the cultivator instead of the Government. Certain concessions to him may be justified in the initial stage of introducing methods and demonstrating their worth, but the cultivator should not always depend upon a government agency to do the work for him. He should at least give full recompense for the expense involved.

Under this expanded Program extension personnel will be trained in various fields of agriculture at specified centers in the States. The Plant Protection Services should be asked to help in the training - without a doubt they will be asked to contribute, and therefore some thought should be given to policy and curriculum to be followed. As far as implementation of the training is concerned the group may or may not feel that outside technical assistance is advisable to aid in the initial stages of the Program. If they do so desire such aid, I am sure the agencies now cooperating with the Indian Government will gladly entertain requests. It might be advantageous to have some plant protection specialists experienced in extension teaching to aid with the training program for a year or two. Indian personnel would be most desirable if available because foreign specialists are at a great disadvantage due to their lack of familiarity and knowledge of local agriculture. However, foreigners may contribute a great deal in terms of experience, ideas and viewpoint.

I suggest that each Development Project and Area have the necessary complement of full time plant protection personnel to carry on training and demonstration work. The main interest and objective of these fellows is to give the Development Projects a good trial. This means that they must have a real spirit to make the Program a success. Therefore, personnel must be chosen carefully and given the responsibility of carrying the work forward without encumbrances. They should be given a free hand to develop.

. The Development Project personnel would not only be responsible for teaching plant protection subject matter to the extension trainees but also they must carry on a demonstration program of pest control in the area assigned to the Project. In this way they will obtain experience in using extension methods in the villages; they will come face to face with the difficulties and problems of teaching the cultivator. This experience will make the Plant Protection Specialist better equipped to work with the trainees.

Administratively, I believe that the Plant Protection Service personnel assigned to the Development Projects should be made a part of the Project staff. They should follow policy laid down for the administration of the Project. However, technical guidance should come from the Plant Protection Service.

Along with a program of extension teaching consideration must be given to a distribution system for pesticides so that machines and materials are available to the cultivators when needs arise. If cultivators do not have the necessary capital for such purchases credit may be extended to them or machines may be used on a rental basis. The cooperative unions should be willing to play an important role in the distribution scheme. The managements of the Unions will need the guiding hand of the Plant Protection Services in selecting types of machines and pesticides for stocking as well as for training of staff personnel in plant protection methods.

The time is at hand when some thought must be given to means of regulating the sale and use of pesticides. As the market for insecticides and fungicides expands, as it is bound to do, spurious products will find their way to the cultivator unless means are taken to check illicit trade.

Certain labelling regulations should be promulgated and enforced. Also, since most modern pesticides are highly poisonous, hazards to public health may be involved in their use. It is most difficult to regulate the use of such materials when they are freely available to cultivators. However, thorough education on proper usage will be helpful. Adoption of standard recommendations which in the opinion of the Plant Protection Service are desirable might be made available to manufacturers with instructions that labelling should conform to the recommendations. Perhaps the Central Protectorate should be given the responsibility for approving labels of products to be placed on the market. Enforcement of such regulations may be difficult but the mere fact that certain rules exist may be a deterrent to misrepresentation and misuse.

Again may I express regrets that I will not be able to attend the conference. With best wishes to all,

I remain,

Sincerely yours,

(Sgd.) W.A. Rawlins

FAO Plant Protection Specialist.

APPENDIX B

Sri A.N. Jha
Secretary to Government of Uttar Pradesh
Agriculture Department
Lucknow

Transmitted 27 March 1952
after approval from Rome
Headquarters FAO.

Dear Mr. Jha,

As my term as FAO Plant Protection Specialist assigned to the Government of Uttar Pradesh nears an end I wish to submit the following comments on the Plant Protection Service. The final report to FAO will carry recommendations which this observer feels should make the work of the Service more effective.

Obviously, the task before the Service is an enormous one and the work is essential in these critical times to prevent food damage from insects, rodents and plant diseases. Plant Protectionists insist that food deficits would be eliminated if pest control measures are adequately used in India. May I add that plant protection is only one of the facets of the agricultural picture that must be improved in order to grow more food. As better crops are grown through improved farming practices pest control will assume greater importance and will be more valuable.

During the past few months I have visited many of the centers and sub-centers maintained by the Plant Protection Service. Conferences were held with the personnel to discuss technical problems relating to pesticides, methods of application and equipment. The technically trained staff appear to be very capable, conscientious and well grounded in the subject matter of pests and pest control. Practical experience is obtained when the staff personnel are faced with the problems in the field. In general, training seems to be sufficient for the measures ordinarily used in Uttar Pradesh.

Equipment maintained for pest control appears to be adequate. Good judgement was used in selecting the types of machine for application of pesticides in the field, grove and go-down. The type of field lay out common to Indian agriculture does not lend itself to heavy mechanized equipment so familiar to the American scene. Hand operated, light weight equipment is the most convenient for Indian fields and, as plant protection becomes more popular with cultivators, small applicators will be in demand. Some attention might well be paid to improvement of existing hand operated machines to correct faults and increase servicibility. This is a task for agricultural engineers and the plant protectionists working on a cooperative basis.

The Service was instituted to teach the cultivator the value of pest control and the techniques involved so that he might practise pest control measures on his fields. This is the main objective. The procedure adopted by the service is to solicit work from the cultivators and perform the control measures either gratis or on a fee basis depending upon the pest problems involved. In this manner the cultivator is expected to appreciate the benefits from preventing pest damage and learn the methods used so that he may apply them to his crops. However, it is my impression, gained from

talks with the staffs of field stations, that cultivators look upon the efforts of the Plant Protection as a service to be called upon when problems arise. They depend upon the Government to do the work for them. But the task of pest control is so tremendous that the staff as at present constituted can hope to do only a small portion of the work that needs to be done. The cultivator will have to shoulder the responsibility of meeting his own problem through his own efforts. This means a greater emphasis on extension teaching by the Plant Protection Service. The final report to FAO will describe ways of implementing this action.

In other States where this observer has had the opportunity to survey the organization and work of Plant Protection the technical and extension services team up together in a closely knit unit. Technical personnel, entomologists and plant pathologists act mainly as advisors for training the village level workers to aid the cultivators in combatting pest attacks. The village extension personnel are generally agriculturists and do not limit their teachings to plant protection alone. In such organization the Plant Protection Service has a relatively small staff of technically trained officers and relies on the extension service to carry out the field routine. The scheme appears to be efficient both from the standpoint of money spent and work accomplished.

This sort of organization cannot be applied to Uttar Pradesh as the present extension service is made up with a number of departments each with a separate staff serving the cultivator. If integration of the extension activities of these departments is deemed unnecessary, and that the present plan is efficient, the Plant Protection Service must carry its own extension staff.

A pressing need noted in the field stations is transport. Only 5 of 21 centers or sub-centers have a means of transporting staff and equipment to the fields of operation. Public conveyances must be relied upon, which makes for considerable inconvenience and loss of time. Efficiency in operation is reduced accordingly. This is an administrative problem, and it is not in the province of the observer to offer recommendations thereon, but a reasonable solution would greatly facilitate the work of plant protection.

If emphasis in the program of the Service is directed toward the extension side some provisions must be made to place plant protection materials and equipment in the hands of the cultivator. Arguments put forth by the field station personnel are to the effect that cultivators are usually too poverty-stricken to afford pesticides and machines. This being the case, methods of providing credit on materials and rental on machines may be essential. In some States Government allows their Plant Protection Services to sell pesticides to cultivators at cost and loan equipment for a small fee. This is a stop-gap measure until a better merchandising plan can be instituted.

The question has arisen regarding a replacement on the present project after my terms ends on April 1st. Due consideration has been given to this question in a conference with Dr. Lal, Entomologist to the Government, who would be chiefly concerned with a continuing program of technical assistance. In view of the fact that the Service personnel are well chosen and versed in the technical aspects of plant protection the need for further aid along the lines presently undertaken does not appear to be necessary.

It is the feeling of both Dr. Lal and myself that for continuation of the FAO assistance in plant protection the Government should take advantage of the fellowship program of the Organization. At least two staff members of the Plant Protection Service, an entomologist and a plant pathologist, could be considered for general training, details of which must await future planning. It is my recommendation that a member of the research group of the Service be selected to take specialized work relating to pesticide residues on crops as hazards to public health, to the soil and to the insect enemies which maintain a check on many pests. In some countries the widespread usage of very poisonous pesticides are creating problems which may or may not attend similar usage in India.

This is in brief a report on my assignment to date which is respectfully submitted for your consideration.

Yours sincerely,

W.A. Rawlins

FAO PLANT PROTECTION SPECIALIST

APPENDIX C.

Dr. K. B. Lal,
Entomologist to the Government
Kanpur.

Date: 21 January 1952
Carlton Hotel
Lucknow.

Dear Dr. Lal,

As Plant Protection Specialist on assignment from the Food and Agriculture Organization I have reached the halfway point of my stay of six months in Uttar Pradesh. It is time to take stock of my activities and impressions to date of the Plant Protection Service.

You may recall that, after due consideration, we made out a program for my part of the technical assistance sponsored by FAO. It was suggested that I first become acquainted with the Service personnel at the annual refresher course and then visit the centers and as many sub-centers as possible. The main objectives of the visits are to make acquaintance with local organization, review methods used for plant protection and discuss with the field personnel technical problems which may occupy their minds. At the same time the visits would give me an opportunity to note progress from a detached point of view and to gather ideas for improvement in those instances where I believe improvement could be done.

This progress report is not intended to carry recommendations, but merely to summarize my impressions to date with the added thought that we may be able to discuss the points in the near future.

The following centers have been visited: Lucknow, Banaras, (Mirzapur, Azamgarh) and Meerut (Dehra Dun, Sahranpur, Bijnor). The place names in parenthesis indicate the sub-centers from which the personnel came to the center for conferences. Calls were also made at sub-centers located at Allahabad and Agra. To date ten of the 21 field stations have been represented at the meetings.

Further tours included Delhi where a lecture was given at a meeting of the Entomological Society of India. Discussions were held with various individuals concerning plant protection. Over the Christmas holidays I spent a few days at Jaipur, State of Rajasthan, with Mr. D. V. Kohli, Plant Protection Officer, who reviewed the organization and work of his service.

Tours planned include Bombay and Hyderabad States to discuss Plant Protection work with state officials and to obtain information on the present distribution of pesticides from manufacturers and their plans for the future, if and when greatly increased demands are created.

In the next few paragraphs I will endeavor to give the most significant findings from visits on the various tours mentioned.

Allahabad - This sub-center is newly established. The staff did not indicate that difficulties of a serious nature had been encountered. They seemed to be satisfied with the functioning of the Plant Protection Service. Cultivators are not well acquainted with the purpose of the organization hence requests for services have not been many. The staff intends to advertise their work with greater energy.

Allahabad (Agricultural Institute) - A new development at the Institute has been the inauguration of an extension service in a small group of villages for the purpose of fostering new ideas in agriculture and homemaking at the village level. An Institute graduate with a rural background has been assigned as the extension agent. He is making his home in one of the villages, living the life of the villager and hoping to gain respect so that his teachings will be accepted. He offers advice on plant protection problems but must necessarily confine his suggestions to simple control measures since application equipment is not available. As a medium of education the village newspaper is used, as well as posters placed around the village area in conspicuous places.

Banaras - Three days were passed with the assistants from the center and two sub-centers in a free and interesting discussion of plant protection work. The men seemed to feel that the Service functions well although more work could be performed if the cultivators would show more active interest. A rough indication of the amount of work that could be done in relation to the total that should be done was requested. It was difficult to arrive at a figure but it suffices to say that all agreed that only a small portion of the whole could be done with the present staff. I suggested that major emphasis should be placed on education of the cultivators; first to show him the value of pest control, then to show him how to apply control measures. The reaction of the group was not favorable. The argument centered around the present plight of the cultivator. Although he appreciated the value of pest control he is too illiterate to understand the techniques of application and too poverty-stricken to purchase equipment and materials. Therefore, the cultivator would depend upon the Government to help him.

Agra - This sub-center is newly established and has had no serious problems or difficulties. Conversation was concerned chiefly with methods to interest the cultivators in plant protection work. In general, conversation indicated that rural people are rather apathetic to needs of pest control and also fatalistic. They gather around during operations in the field and are given explanations of the work being done, but it is doubtful whether they profit from the words of wisdom.

Delhi - I visited with Mr. Horace Holmes, who is an advisor to the Pilot Development Project, to discuss the present extension system of Uttar Pradesh in the light of his experience and how a coverage of plant protection might fit into the scheme of things. He ventured the opinion that too many agencies, independent and bureaucratic, were already in the field and the cultivators were quite confused with so many advisors bidding for attention. The solution would be to combine the extension activities of the present

agencies into one group thus doing away with the multitude of advisors. Instead, a general agriculturist, not a specialist, would do the advisory work at the village level. The specialist would bring the results of research in his subject to the village level worker in such a way that the information could be readily applied to the field.

Mr. J. M. Orchard, Point Four technical assistant assigned to the Indian Farmer, thought that the editors of this leading Indian farm journal would welcome timely articles on plant protection. It would not matter to them whether the information came from the Central Protectorate or the State services as long as the informer was a specialist in the field and spoke with authority. Good articles may be given widespread distribution as reprints published in Hindu and other Indian languages.

A conversation was held with Mr. M. J. Kirschner, a representative of the Geigy Ltd., distributors of pesticides. He said that little head-way had been made in setting up distributorships because of the lack of demand for pest control materials. He thought that ultimately the manufacturers would find it most advantageous to sell their products through village cooperative societies. First, the cultivators must be awakened to the need of preventing the wastage of food from insects and diseases. This, Mr. Kirschner contended, is a government job. I wish to disagree, because it is the job of both government and industry to cooperate in the education process in a forthright and honest manner.

Meerut - Two very interesting days were spent with assistants of the center and two sub-centers. I received the impression that the cultivators in the western part of the state are more progressive than those in the east, because the response to plant protection measures has been appreciated and valued. Some large mango orchardists have made inquiries about the purchase of equipment for spraying their groves and those of their neighbours on a fee basis. This is a hopeful sign that some enthusiasm has been aroused in cultivators to help themselves and not depend entirely on the government. However, the charges of the Plant Protection Service for spraying is less than the retail cost of the insecticide to the cultivator and, hence it seems unlikely for the present that mango growers will be interested in purchase of equipment. A good deal of potato spraying is being done in the Meerut district, but on farms of operators who could well afford to own sprayers and hire labor for application. I was told that a weekly paper is distributed through most villages by the panchyats and that short articles could be published therein. The assistants thought that the weeklies would be an excellent way to advertise the work of plant protection in the villages, but they did not wish to submit articles without the consent of headquarters. Perhaps short compositions from headquarters could be sent to the field stations desiring them. I was quite surprised to learn that cultivators within reasonable commuting distance of large towns are avid movie fans. Movie shorts on agricultural subjects might well be produced if facilities are available for showing in country town cinemas, providing production facilities are available to the Plant Protection Service.

My impressions of the junior and senior staff assistants in the field centers are very favorable. They appear to be very capable and anxious to perform to the best of their ability. In fact I believe that the men could be used effectively for conduct of demonstrations and certain phases of field research.

By demonstrational work I mean the setting up on village holdings of small field plots which are sprayed or dusted to show the cultivators the benefits and value of pest control measures. The present program followed by the staff seems to be merely to spray or dust infested areas when appeals are made by the cultivators for aid. In this way it is hoped that the cultivators will take heed by recognizing the value of pest control and continue to ask for more and more help. I have been told that the assistants canvass the villages when time permits to survey for infestations and deliver lectures of timely information to the villagers. Demonstrations might well be included as a tool for teaching.

Referring to research work, I believe that the field assistants are qualified to conduct relatively simple experiments such as a comparison of methods of application (spray vs dust), pesticides, methods of assessing data etc. Guidance would be needed from the research staff to plant the experiments and formulate directions to be followed. The assistants would then initiate the work, carrying on with the tests throughout the season. Undoubtedly such endeavors would stimulate interest and loyalty in the Service and would also give the research staff an opportunity to judge the performance of pest control materials under more varied conditions.

During my visits to the center I have discussed with the junior assistants who are in charge of sub-centers the efficiency with which they carry on their work without easy means of transport. They must go to the field by any conveyance available, train, bus, bullock cart, or afoot. The inconveniences encountered reduce the efficiency of their work tremendously - at least one-half, I am informed. The answer is to provide motor transport or make some sort of arrangements with other agricultural agencies in the area to use their transport.

Considering the objectives of the Plant Protection Service, conversations with the assistants have left me with the impression, perhaps erroneous, that the organization exists for the sake of service - to perform the necessary control measures upon call from the cultivators. If the cultivator learns something from the work, so much the better. I believe that the thinking of the staff should be along lines of using all possible means of educating the cultivator to appreciate pest control and perform the work for himself. I certainly do not intend to depreciate the work done by the Plant Protection Service, but I cannot help feeling that the amount of work accomplished at present contributes very little to increasing the food supply of India. The cultivators must do their part. The responsibility for cultivator education will rest on the shoulders of the Service and the cooperatives of other business will supply the machines and materials.

In writing this letter I have a two-fold purpose: (1) to inform you of my activities and (2) to indicate my thinking regarding the program of the Service. My impressions may be quite wrong, because it is obvious that the visits made enabled only a very superficial survey to be made of the actual situations, and wrong impressions might easily be gained. However, some of the points raised will provide a basis for discussion at a later date.

Yours sincerely,

W. A. Rawlins
FAO Plant Protection Specialist

APPENDIX D.

A BRIEF NOTE ON THE PLANT PROTECTION SERVICE IN RAJASTHAN

1. ORGANIZATION. The Plant Protection Service was started in Rajasthan during the year 1950. The Service is under the charge of the Entomologist and Plant Protection Officer who has had advanced foreign training in the field of Economic Entomology and applied Plant Pathology. He has under him at his Headquarters one Assistant Entomologist detailed for pest control operations, another Assistant Entomologist for plant protection research and one Assistant Plant Pathologist detailed for disease control operations in the field. At the lower level there are Plant Protection Supervisors, one at each of the five Divisional Headquarters of the State. Four to six districts comprise one Division in Rajasthan. Under them are Plant Protection Mukaddams, 2 to 6 posted at district headquarters and in the interior. At the district level the Plant Protection Staff is closely associated with the District Agricultural Officer and the Plant Protection activities are actually organized through the help of the District Agricultural Officers and their staff. The District Agricultural staff normally have much closer contact with the farmers than the Plant Protection staff and, therefore, they provide an important link between the farmers and the Plant Protection Service. While organizing large scale campaigns, as in case of anti-locust measures and grasshopper control, the cooperation of the officers of the Revenue Department is also available. Actually, for purposes of locust control, the Collector of a district who is the Chief Revenue Officer at the district level is placed in charge of anti-locust measures for his district, and the Plant Protection staff provides the technical help and materials required for control operations.

The Service comprises one Entomologist and Plant Protection Officer, two Assistant Entomologists, one Assistant Plant Pathologist, 7 Plant Protection Supervisors, 60 Plant Protection Mukaddams, one Mechanic and other Ministerial staff.

2. WORK ACCOMPLISHED DURING THE YEAR 1951. The output of work during the year 1951 is shown in the attached statement. It may be mentioned here that since the Plant Protection Service came into being in Rajasthan State, the staff has been mostly busy with anti-locust measures, as Rajasthan forms the major locust breeding area in the Indian Union. During the year under review there were about 267 adults locust swarms reported from different places and about 5 to 10% of the adult swarms were destroyed. Breeding of locust occurred over an area of approximately 4130 sq. miles. The control measures were mainly directed towards the destruction of hoppers in order to prevent the formation of adult swarms. The success obtained in this direction has been phenomenal, as the hoppers were everywhere destroyed before they could

reach the winged stage. Also, no damage was allowed to be done by the locust hoppers to the standing crops. In this connection I may mention that Mr. Norris Dodd, Director-General of the Food and Agriculture Organization, in his broadcast speech on All India, has confirmed what I have stated in the above paragraph, and has further remarked that any country should be proud of such an achievement.

3. APPROXIMATE COST TO THE GOVERNMENT. During the year under report the expenditure incurred by the State Government on Pest and Disease control measures, including anti-locust measures, was about 4 lakhs of rupees.

Sd/ - Dharm Vir Kohli
Entomologist and Plant Protection Officer
Rajasthan
Jaipur

Encl. 1 statement.

FAO 52/11/7116

STATEMENT OF PLANT PROTECTION WORK DURING THE YEAR 1951

Area deratted	35,008 acres of cultivated land cleared of rats.
No. of fruit trees sprayed against pests and diseases.	1. 5,944 citrus trees against wither tip, citrus canker and citrus psylla. 2. 1,327 Mango and 'Ber' (Zizyphus-injubae) trees against mango hoppers and fruit fly.
Area under vegetable crops sprayed or dusted against pests and diseases.	396 acres of vegetables sprayed and dusted against various pests.
Area under field crops sprayed or dusted against insect pests.	1. 1,600 acres Kharif crops sprayed with 25% water dispersible B.H.C. against red hairy caterpillar (Amsecta Spp:). 2. 52,023 acres of cropped areas, 30,300 acres of non-cultivated area cleared of grasshoppers (Heiroglyphus sp) by dusting with B.H.C. 3-10 %.
Details of locust control operations.	1. 267 swarm movements reported, of which several swarms were destroyed by burning and dusting operations. 2. Breeding of locust occurred over an area of 4130 sq. miles. The hoppers were destroyed by dusting with B.H.C. and trenching. No swarms were allowed to develop as a result of local breeding. There was no damage to standing crops.
Grain fumigation and seed treatment against diseases, etc.	1. 1,000 Mds. Jowar seed treated with Agrosan against amut of Jowar. 2. 9 seed and grain stores fumigated against stored grain pests.
Estimated increased production or reduction in losses as result of plant protection measures, giving necessary details.	Estimated increase in grains 5,28,420 Mds.
Grain in Rs. with necessary details.	Gain of Rs. 5,28, 4200/- at Rs. 10/- per Md.
Remarks.	For most part of the year Staff remained busy on anti-locust measures.

APPENDIX E.

PLANT PROTECTION ORGANIZATION

BOMBAY STATE

One of the most important aspects of rural development work in relation to crop improvement is the extension of protective and control measures against insect pests and plant diseases of field and garden crops. In 1948, a scheme for the organization of crop protection Service in Bombay State was sanctioned by the Government for a period of one year in the first instance and subsequently extended on a yearly basis. Now the Government is considering making this scheme a permanent feature of the Bombay Agricultural Department. The object of the scheme is to indicate how the District Agricultural Officers, who are interested in undertaking suitable measures for the prevention and control of insect pests and plant diseases of crops in their districts, could co-operate effectively with one another and with the expert technical staff of the Agricultural Department in placing such work on an organized basis throughout the State and in developing a "District Crop Protection Service".

The work of the scheme will be under the technical control of the Crop Protection officer, the higher supervision and guidance being provided by the Plant Pathologist to the Government and the Agricultural Entomologist to the Government. Since August 1950, the Crop Protection Officer has been placed under the administrative control of the Agricultural Entomologist to the Government, Bombay State, Poona.

Under the scheme, the districts of the State have been grouped together in eight groups for the purposes of organization of crop protection measures against insect pests and plant diseases. These groups, which have been drawn up in the light of past experience of the incidence of different types of insect pests and plant diseases, are as follows:

	DISTRICTS
Group I	Ahmedabad
	Kaira
	Banaskantha
	Mehsana
	Sabarkantha
	Amreli
Group II	Broach
	Surat
	Daroda
	Dangs
Group III	Thana
	Bombay Suburban
	Kolaba

	DISTRICTS
Group IV	East Khandesh East Khandesh Nasik
Group V	Poona Satara (N) Ahmednagar
Group VI	Sholapur Dijapur
Group VII	Belgaum Ratnagiri Kolhapur Satar (S)
Group VIII	Dharwar Karwar

Under the scheme, the under-noted organization has been established in each group of districts or in two groups of districts:

(a) An Agricultural Officer (one officer for every two groups of districts) to work under the technical control of the Crop Protection Officer for -

(i) Advising and assisting cultivators in the groups of districts concerned in scientific methods of crop protection against insect pests and plant diseases.

(ii) Organizing an "Information Service" for giving early notice of insect pest and plant disease attack on crops to the Agricultural Officer, and

(iii) Maintaining a depot or depots for stocking of suitable fungicides, insecticides and appliances.

(b) One or two Agricultural Assistants to work in each district of the group, under the technical control of the Agricultural Officer.

In organizing protective and control measures against insect pests and plant diseases in a district, the Agricultural Officer concerned will work under the administrative control of the District Agricultural Officer of the District. In the event of a severe outbreak of a crop pest or disease in a district, the staff from the neighboring districts will be called upon to assist in organizing control measures.

Under the scheme, each district is provided with a certain number of dust guns, sprayers and insecticides. The insecticides are sold to cultivators at full cost except when special concessions are given under specific schemes and the staff looks after the work of propaganda for the pest and disease control throughout the State.

During the year 1950, the organization looked after the advisory work and organized the control of army worms in Surat district, thrips in Sholapur, rat trouble in Gujrat, flea beetle and Udadva beetle in Nasik and mango hopper control in Gujrat, Ratnagiri and Dharwar districts. Besides organizing control operations against pests and diseases under the scheme in question, the Crop Protection Organization helped in the implementation of the following short term schemes. In fact, the Crop Protection Organization has been serving as co-ordinating unit for all plant protection schemes in Bombay State.

Schemes for setting up an anti-locust organization. Under the scheme, hundreds of dust guns, sprayers and nearly 200 tons 10% BHC were distributed to the districts of Gujrat, East and West Khandesh and Thana and Nasik. In 1950, breeding of desert locust took place in Banaskantha, Mehsana, Sabarkantha, Ahmedabad and Kaira districts, while in 1951, only Babaskantha and Mohsana were infested by hoppers. The insecticide was given free to cultivators and large scale control measures were adopted and, though the problem of control was enormous, a large measure of success was achieved.

Control of Crab in Poona district. A special scheme for control of crabs in the paddy fields was organized with funds provided by the District Rural Development Board, Poona, during the Kharif season of '50. About 250 acres were treated with cynogas which was distributed free to those cultivators desiring it, and good success was achieved.

Schemes for the control of Deccan wingless grasshoppers. With the help of the Crop Protection staff the technical facilities for the control of this pest were extended to needy cultivators. Compared with the previous year, the infestation of this pest was less. As a result, a little over 6,000 acres only were treated 1950-51, and about 5,000 acres were treated in 51-52. A subsidy of 2/3rd the value of insecticide was previously given to cultivators; however, the subsidy has been now reduced to 1/2 the cost.

Scheme for the control of Blue Beetle and Blast of rice. The treatments for the control of these two serious epidemics were combined and a schedule of control measures was advocated; DDT was used for Blue Beetle control in the early stages, and parenox for Blast disease. In the later stage, when Blue Beetle appeared in the field, 5% BHC was used for control. About 1000 acres were treated against Blue Beetle, and seeds sufficient for over 4000 acres were treated for prevention against blast of rice. The insecticide and fungicide were distributed free of cost. The pest and the disease did not appear in serious form in the districts other than in Kolabam Ratnagiri, N. Kanara and Nasik.

Smut of jowar, which is responsible for reduction in the yield of the crop has been effectively controlled by dusting jowar seed, before sowing, with sulphur dust of the order of 300 mesh fineness. In 1950 the Government had sanctioned free distribution of sulphur for control of jowar smut and the quantity of sulphur thus distributed was sufficient to treat the seeds for over 10 lacs acres. Later on, the cost price of sulphur is being charged to cultivators.

APPENDIX F.

NOTE ON THE PLANT PROTECTION SERVICE IN MADRAS STATE

In 1949 a separate staff was appointed to be in charge of Plant Protection work. Prior to that the work was done by the normal Tahsil propaganda staff. Much headway could not be made, since the normal staff had too many items of work in hand. Since the appointment of a separate district staff, spectacular progress has been made, far beyond our expectations. This is a striking and confirming point against the idea of favoring "multi-purpose-workers" - a scheme now being supported and given effect to, on a large scale. The farmers have come to realize the effectiveness of the remedial measures recommended and they are freely adopting them. The figures furnished below will demonstrate the success of the scheme:

	Non-recurring	Recurring	Total
1949-50	67,933	3,63,918	4,31,851
1950-51	61,728	10,42,118	11,03,846
1951-52	1,74,970	13,18,500	14,93,470
1952-53	1,26,500	13,67,700	14,94,200

Note:

(i) financial (otherwise termed official) year begins on 1st April and ends on 31st March every year.

(ii) the expenditure shown for 1952-53 is that proposed.

(iii) non-recurring expenditure relates to purchase of dusters, sprayers, both hand and/or power operated types and cost of repairs done, if any.

(iv) recurring expenditure relates to purchase of pesticides (insecticides and fungicides) for sale to the farmers and cost of transport.

A. STAFF

The State is divided into 26 districts, the average area of each district being about 4500 square miles.

The organization is as follows:

Headquarters of the State:

i. Director (sanction authority).

ii. Deputy Director (co-ordinating and guiding).

	Northern division of the State	Southern division of the State
	iii. Supervising staff	(Same as for Northern division)
REGIONAL	(a) Plant Protection Officer (Entomology)	(b) Plant Protection Officer (Mycology)

	Northern division of the State	Southern division of the State
	iv. Executive staff:	
	(a) There are 26 Plant Protection assistants - one for each district.	(b) There are 26 Plant Protection assistants - one for each district
	(Graduates in Agriculture)	
DISTRICT	(b) Each Assistant has the help of the Mistry and Messenger (or peon)	(b) Each Assistant has the help of one Mistry and one Messenger (or peon)
	(Able to read and write the language of the tract. The Mistry is trained in executing remedial measures and in the working and proper maintenance of dusters and sprayers)	

Note: The Plant Protection Assistants act as Personal Assistants to the District Agricultural Officer. They attend to correspondence relating to insect pests and fungus diseases affecting crops, the placing of indents for pesticides, the supply of advice to Taluk Agricultural Officers regarding medical measures to be adopted, and the organization of campaigns on a large scale. Normally the Taluk Agricultural Officers attend to day-to-day complaints and small scale campaigns. The normal Personal Assistants are completely relieved of this work.

B. STOCKING PESTICIDES AND MACHINERY

Each Taluk is stocked with a sufficient quantity of pesticides, found suitable by trial, to meet the normal demand.

In addition, a reserve stock is held at the headquarters of the district.

Each Taluk depot has a stock of hand-operated dusters and sprayers. In each district there is at least one power-operated sprayer.

Fees are collected from farmers only for operating power-operated sprayers. For the use of hand-operated sprayers and dusters, no fee is collected.

In cases of emergency, to fight a large-scale campaign, the stock of pesticides and machinery is moved from Taluk to Taluk.

The District Agricultural Officers are empowered to move the field staff from Taluk to Taluk in cases of emergency within the district.

The Plant Protection Officers are empowered to move stocks of pesticides and machinery and even personnel from district to district within their jurisdiction in cases of emergency. They can take action and report the fact to the Director of Agriculture for ratification.

In cases of very large-scale campaigns and in cases where there is a break-out of attack simultaneously in more than one place, and if it is found that the number of sprayers and dusters is not enough, the farmers have gladly taken up "hand-splashing" of pesticide, though it costs a little more, instead of waiting for arrival of dusters. This clearly shows the co-operation given by the farmers.

In cases where sprayer is necessary, the farmers have resorted to all kinds of ingenious methods, e.g. splashing the liquid through "rose" cans and with the help of a bunch of leaves.

C. SALE PRICE OF PESTICIDES

The pestides are sold at half cost for root crops, e.g. rice, millets, potato, tapioca, vegetables, and for other crops full price is charged.

In special cases, when dry land crops are affected, the pesticides are sold at quarter cost. Free supply has never been adopted as the experience of the Department is that anything given free is generally considered by the recipient as good for nothing.

Example:

	(Food crops) Half sale price Rs.	(Non-food crops) Full sale price Rs.
(i) Cost of pesticide 100 lb. at 8 annas per lb. Rs. 50/- (half-cost recovered)	25	50
(ii) Indidental charges,* e.g. packing and transport from firm to first depot in the district	10	10
	Rs.35 for 100 lb.	Rs.60 for 100 lb.

* Incidental charges incurred by transferring stock from one Taluk depot to another Taluk depot within the district and/or from one district to another district is not included in the sale price. These are met by the Government.

D. REPORT ON DETAILS OF WORK

The annual report of the Plant Protection Officers, giving the details of work done, viz. area and/or number treated, crops affected, details of damage done, pesticides used, etc. is being printed and copies can be made available if a reminder is sent in June/July 1952.

The office copy can be made available for perusal if a visit to Madras is planned.

APPENDIX G.

PLANT PROTECTION IN THE UNITED STATES

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Man's efforts to produce enough food for humanity are made most difficult by the depredations of insects and plant diseases. Plant protection scientists maintain that the earth could produce enough for its peoples and their flocks if pests of various kinds did not consume a share of the production. In India, for example, food damage from insects and diseases is variously estimated to be 10 to 20 percent, a shocking loss in a country with short supply of food. Likewise, American agriculture is faced with similar problems and only with herculean efforts are losses kept to a minimum. Even so the unpredictable attacks of pests cost the American farmer millions of dollars annually, a loss that is keenly felt though the pressure for food is not as great in the U.S.A. as in India.

The need for India to import thousands of tons of foodgrains to supplement the domestic supply might be sharply reduced, and perhaps entirely eliminated, if the wanton damage by pests is prevented. What can be done about the situation? Who is to do the job? Obviously, it must be a co-operative effort to devise and use control measures against the injurious insects and plant diseases.

The Government of Uttar Pradesh sponsors a plant protection organization, the sole purpose of which is to assist the cultivator in his fight to prevent crop losses from pest attacks. When insects and diseases appear in their fields cultivators may call upon this organization with its trained staff of entomolgists and plant pathologists to conduct such control measures as may be necessary. Through actual practice and demonstration the Plant Protection Service teaches the cultivator the fundamental concepts of insect and disease control. In time he should become a plant protectionist in his own right and be able to perform the measures as he does any other farming operation.

In the U.S.A. plant protection is organized on a different pattern. The American farmers are well acquainted with the importance of pest control, and spraying and dusting has become an integral part of good farming practice. Therefore, the Government does not maintain a body of trained personnel to function as a service organization and fight the pests whenever outbreaks occur. Instead, the farmers are informed of recommended control measures, taught how to spray and dust their crops, and which chemicals to use for specific attacks of insects and diseases. Then it is the responsibility of the farmer to protect his own crops following the advice of the government specialists. He must purchase from the common trade channels the necessary pesticides and equipment for carrying out the control work.

This sytem requires the close co-operation of plant protection scientists and agricultural advisors called county agents. The latter group make up the backbone of the American extension service, renowned in agricultural circles the world over for its efficiency in teaching progressive farming at the "grass roots" level. The county agents work solely in the agricultural districts in close association with the farmers, being collego-trained in general agriculture and with a missionary zeal to make farming a better, more profitable occupation. They not only give advice on plant protection problems but advise as well in other branches of agriculture such as animal husbandy, horticulture, farm economics, engineering, fruit growing and other fields. The county agent is the liaison between the scientist who develops new ideas and the cultivator who will put those ideas into practice.

In reality the system for plant protection in the U.S.A. is quite simple. New facts about pest control measures are discovered by the researcher after conducting varied and painstaking experiments - experiments performed not only in the laboratories and on lands of the government-supported institutes but also on the fields of progressive farmers. By the latter arrangement, facts are obtained under actual field conditions, thereby allaying the criticism so often directed toward research conducted within the confines of the experiment station. Sometimes information obtained from laboratory research does not produce the expected results when practised by the farmers. They naturally become suspicious and critical of experiment station research until tests are made under actual farming conditions. In fact, these farm tests or experiments are valuable other than as sources of information. The farmer takes a keen interest in the procedures and in the results. So do his neighbors. They may judge for themselves the relative merits of the various plant protective measures, their value, and their practicability as regular farming operations and they put into practice the good ones without being urged.

Of course, not all cultivators become acquainted first hand with the experimental research. How, then, are the scientific facts presented to the uninformed so that they may understand and put into practice the new ideas of plant protection? The answer is - by the spoken and written word, by visual aids and by exhibits and demonstrations at gatherings of the farming public. Essentially, the education process is an advertizing task - to sell new ideas to the cultivators. The extension servant, professor and county agent, must use phsycology, patience and perseverance, for cultivators the world over are known for their conservatism.

Let us see how the extension Service brings the work of the scientist to the cultivator for practical application in the field. When the researcher has satisfied himself on the value of a plant protection measure he passes the information to a colleague on the extension staff of the agricultural college. It is the duty of the extension plant protectionist to aid the county agent in propagandizing the method to the farming public. Detailed accounts of the research are published in bulletins for the benefit of fellow scientists and for those farmers who have the patience to read through data, graphs and technical descriptions. Usually farmers prefer short stories

about the research, written in a popular concise style, conveying the basic ideas without technical jargon or complicated explanations. These articles are feature items in farm papers and in the "Extension News", the official publication of the Extension Service. Of course, radio is very important for the dissemination of information, as most farmers have sets in their homes. Also, the county agents organize meetings attended by the Agricultural College extension specialists who will explain new developments and methods to the cultivators. Thus, every effort is made to show the farming public that research is a means to improvement and efficiency in farming.

Exhibits and demonstrations are important devices in the Extension Service repertory for teaching. The former aim to teach details necessary for understanding the pest, such as life history, damage inflicted, chemicals used to stop it and when to make the applications. Exhibits must be relatively simple in design, yet tell a connected story. There must be an appeal to the eye, because the onlooker needs to be captured at first glance. He will then stop, examine and learn. An exhibit which is over-burdened with charts, specimen cases and machines will be passed over with only a fleeting glance.

Perhaps the most convincing method of propaganda is the use of field demonstrations. A demonstration is much more understandable and educational than a description on paper. Plant protection is well adapted to this way of projecting progressive ideas to the farming public. The county agents in co-operation with the research and extension personnel of the agricultural college use this time-tested method at every opportunity.

Extension pays huge dividends in bringing to the cultivators the research of the laboratories in a practical way so that farming may be more efficient, and so that more and better food may be produced. After all, the ultimate aim of research, no matter how academic, is to advance the betterment of mankind. Plant protection plays an important role in this scheme because humankind cannot afford to share food with insects and plant diseases. There is not enough to go round. Only by close co-operation between scientists, extension teachers and farmers can our food supply line be protected from the ravages of pests.

The following relevant material has not been included in this report since it is available in India.

Printed Bulletin entitled: "Agriculture and Animal Husbandry in the Uttar Pradesh"
Volume FIVE
"Plant Protection Service"
Issued by: Department of Agriculture and Animal Husbandry, Uttar Pradesh (India), March 1950.

Printed Booklet entitled: "Plant Protection Service" (Pest Control)
by Mohd. Qadiruddin Khan, M.Sc., Ph.D.(London) D.I.C.
Government Entomologist and Officer in Charge,
Plant Protection Service, Department of Agriculture,
Hyderabad State, India.